handling and storing the biological information. It is also capable of doing manipulations of vast amount of genome sequences. Microarray technology is known by several names like DNA chips, Gene chips or Bio chips. The array can be defined as an ordered sequence of micro spots, where each spot contains a single species of nucleic acid. The microarray technique is based on hybridization process of nucleic acids. A computer chip is a electronic circuit of a small piece of semiconducting material. A semiconductor is a type of material which is neither a good conductor of electricity nor a good insulator. Generally silicon is used to manufacture microchips. These Chips are usually of small size. This small or micro size of chip helps to make modern computers much fast, compact and portable. Production of microarrays starts with choosing probes to be printed on the array. In most cases, probes may be also chosen directly from available databases provided by the Gene Bank, UniGene etc.

DNA chips can be used for gene expression analysis. DNA chip has an array of immobilized DNA strands, so that multiple copies of a single sequence are grouped together in a microscopic array. DNA chip consist of several spots embedded on a solid surface such as glass substrate. Each spot consists of cDNA probes or small nucleotide sequences, which binds to the complementary nucleotides, according to Watson-Crick complementary structure. Those nucleotides which bind to these probes are fluorescently labeled, observed and calculated electronically based on the ratio of the binding probe with the DNA sequences on each spot. In encryption process of DNA chip, probes are arranged on a square area of small size of glass or silicon matrix. The receiver uses various strands which contain the fluorescent label to anneal with probes which relate to secret information using fluorescent reaction. DNA chip technology is not only limited to encryption of textual data, it is useful in encrypting images also. Ashish gehani et al. proposed a technique of DNA chip-based encryption and decryption of 2D images using substitution One-time pad. A message can be recovered in decryption process only by using the identical one-time-pad and DNA chip, which used in the encryption process [1].

As DNA is a biological element, its molecular properties may change due to environmental conditions. So obviously DNA chip's properties can be changed due to changing conditions of environment. In this sense encryption and decryption process will be unstable and may generate different results.

c) DNA Steganography

Steganography is a technique that hides the secret message inside other message. A secret message can be hide inside any medium like image, audio or video file. There are various methods found in history, which used for hiding information such as invisible ink, tiny pins pictures on characters, letters placed on specific positions of each word or any graphics image can be used to hide secret message etc. In basic DNA steganography, input DNA strands which contain message, each one is tagged with random secret key DNA strands and then can be hide inside other random distracter DNA strands. The plaintext is retrieved by hybridization process with the complement of the secret key strands. Viviana I. Risca proposed a DNA stenographic technique in which DNA encrypted message strand is placed between secret primers and hidden in a microdot .Ashish Gehani et al proposed an improved DNA steganography system by reducing the difference between the plaintext and distracter strands. Due to high storage capacity DNA steganography can be a right option for hiding large scale information. In spite of its simplicity there may be chance that environmental conditions may change the biological property of DNA molecule which can damage DNA sequences. So it may difficult to recover correct plaintext.

4. Conclusion and Future Enhancement

A new chapter of technology has been opened with the development of DNA computing. DNA computing comprises a very interesting area of theoretical computer science. Due to DNA's vast parallelism and storage capacity, it is capable to provide a strong support for computing and Cryptography. DNA Cryptography is a new born technology which is in the development phase and it is in initial stage of research. In this report, a review on DNA computing and DNA based Cryptography is presented. The fundamental DNA encryption techniques are also described. This technology is far away from the actual implementation because of the biological problems related to DNA Cryptography; can be performed only in lab with biological tools and methods under optimum conditions. There are few techniques available like PCR Amplification and DNA digital coding, which can be applied on digital information to perform DNA Cryptography operations based on nucleotide sequence. DNA appears to be well-suited for computations that can be programmed to utilize a low number of operations in a highly parallel fashion. It may be possible to provide hybrid security by integrating DNA Cryptography with traditional Cryptosystems. DNA technology can overcome the problem of current traditional cryptosystems which are limited because of hardware limitations e.g. onetime pad is suitable only for small length of data. In future, DNA chips or Gene chips can replace currently available silicon chips which will exceptionally increase the computational and storage capacity. So there will be no issue about hardware limitations for cryptosystems.

The disadvantage for DNA Cryptography is that it can be affected by environmental conditions. As biological properties of a molecule may change due to environment or atmosphere changes, so it is possible that the recovery of correct information may be difficult. There is need of more work and research on DNA computing and Cryptography to enhance the technical issues and to provide actual realization of this technology.

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